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EXAMINER

TSOY, ELENA

ART UNIT PAPER NUMBER

1762

DATE MAILED: 07/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/751,270

Applicant(s)

JAYARAMAN, SAIKUMAR

Examiner

Elena Tsoy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-24 and 31-36 is/are pending in the application.
- 4a) Of the above claim(s) 21-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 and 31-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4/29/2004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

***Election/Restrictions***

1. Claims 21-24 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 6/01/2006.

***Claim Objections***

2. Claims 14 and 34 are objected to because of the following informalities:  
Claim 14, "...the imprinted ~~subsequent~~ of polymer disposed ..." should be changed to "the imprinted ~~subsequent~~ of polymer disposed ...".  
Claim 34, "subsequently thermal curing the imprinted second of polymer disposed over the first polymer" should be changed to "subsequently thermal curing the imprinted second of polymer disposed over the first polymer".

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:  

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.  
A phrase "subsequently thermal curing an imprinted subsequent lower polymer disposed over the lower first polymer" renders the claim indefinite because the meaning of "*subsequent lower* polymer" is not clear. For examining purposes the phrase was interpreted as "subsequently thermal curing an imprinted subsequent ~~lower~~ upper polymer disposed over the lower first polymer".

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

### *Claim Rejections - 35 USC § 103*

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 2, 4-10, 14-17, 20, 31-32 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Carter (US 6,730,617).

Carter discloses a process for forming a portion of an integrated circuit (See Abstract) comprising (a) placing a stamp 34 against a substrate 20 having a layer 26 of a polymer such as *polyimide* (claimed first polymer) (See column 4, line 35) (b) *partially* curing (claimed imprinting the first polymer) or fully curing the patterned layer by applying heat to the stamp and/or the substrate (claimed conditions to increase the glass transition temperature  $T_G$  of the first polymer) (See column 5, lines 19-22), and (c) removing the stamp 34 from the substrate leaving a pattern of fully or partially cured film 54 (See column 5, lines 46-48), then heating to completely cure the film 54/66 (See column 5, lines 54-56). Procedures similar to those described above may be used to build one layer of an integrated circuit on top of another layer of an integrated circuit. Thus, in a **multilayer** integrated circuit device, an underlying layer of insulated, planarized circuit lines can function as a substrate. FIG. 9 shows a substrate 80 into which metallic studs 86 have been formed. A layer 92 of material (analogous to the layer 26) is deposited on the substrate 80 in a manner similar to that described above in connection with the layer 26. Using a patterned stamp patterned dielectric material 98 may be formed on the substrate 80, as shown in FIG. 10. A **metal** layer 104 is deposited onto the patterned dielectric material 98 (see FIG. 11). As indicated in FIG. 13, additional tiers can then be constructed by

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**repeating** the process, i.e., by depositing another layer 116 of material (similar to the layer 92), and **so on**. The dielectric material 98 may also be advantageously planarized along with the metal 104, so that the tier 110 functions properly as a substrate for lithographic formation of the next layer of circuit lines. Thermal treatments may also be employed to ensure that the patterned dielectric layers have been completely cured. See Fig. 13; column 6, lines 25-55.

As to claim 4, the patterned film 54/66 reveal the surface of substrate (See Fig. 7).

As to claim 16, the metallic film 60 may be deposited onto the patterned dielectric material 66 by methods known to those skilled in the art, such as *electroless* deposition of copper (See column 6, lines 8-14).

Clearly, when the polymer layer is cured with a thermal radiation transmitted through the stamp, the radiation heats the subsequent polymer at a greater rate than the substrate.

As to claim 31, It is the Examiner's position that the processed polymer layer in Jacobson et al in view of Bulthaup et al would have claimed properties, e.g. 10 % or less of a deviation from planarity, since it is prepared and processed by methods substantially identical to that of claimed invention.

It is held that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. See MPEP 2111.02, 2112.01. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

8. Claims 1, 2, 4, 5, 7, 10, 14, 15, 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Jacobson et al (US 6,517,995).

Jacobson et al disclose a process comprising (a) placing a stamp 310 against a substrate 300 having a liquid thereby forming a film 305 (claimed first polymer), (b) *partially* curing (claimed imprinting the first polymer) or fully curing the film 305 by *heating*, UV-exposure (claimed conditions to increase the glass transition temperature  $T_G$  of the first polymer), and (c) removing the stamp 310 from the substrate 300 leaving a pattern of fully or partially cured film 325 (See column 6, lines 7-15), then repeating steps (a)-(c) with a plurality of materials to form a

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plurality of cured layers (claimed subsequently thermal curing an imprinted subsequent polymer disposed over the first polymer) (See column 16, lines 35-45).

As to claim 4, the patterned film 325 reveal the surface of substrate 300 (See Fig. 3C).

As to claims 5, 7, 15, Figs. 6A-6E show formation of a first patterned polymer layer 610 on a substrate 600 with a hole 612 (claimed recess) which exposes substrate surface (See column 9, lines 20-21, 23-34). A first metal layer 630 is formed within the recess 612 (See column 9, lines 40-45), and a second layer 620 exposing a first layer 610 is formed on the first polymer layer 610 (See column 9, lines 36-37). Note that the first metal layer 630 could be considered a first and a second conductive material formed in recess formed by the first and second polymer layer, as required by claim 15, because claim 15 does not recite that the first conductive material is different from the second conductive material.

As to claims 10, 17, the liquid may be an uncured polyimide (See column 5, line 26).

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jacobson et al/Carter in view of Walter et al (US 4,099,913).

Jacobson et al/Carter fail to teach that the thermal cure is selected from microwave radiation, infrared radiation, and convection.

Walter et al teach that infrared lamps, hot gases, ovens, heated rollers are *conventional* heating means for thermal cure of polymers (See column 10, lines 24-26).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used infrared lamps or hot gases for thermal cure of polymer layers in Jacobson et al/Carter because Walter et al teach that infrared lamps, hot gases, ovens, heated rollers are conventional heating means for thermal cure of polymers.

10. Claims 3, 6, 20, 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacobson et al in view of Bulthaup et al.

Jacobson et al fail to teach that the thermal cure is selected from microwave radiation, infrared radiation, and convection (Claim 3); subsequently thermal curing is carried out under conditions to heat the subsequent polymer at a greater rate than the substrate (Claims 6, 20 and 31).

Bulthaup et al teach that the patterned liquid layer can be cured or dried while the substrate and the micro-stamp are in contact using a suitable curing radiation generated from a

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radiation source such as thermal radiation or other suitable radiation that is transmitted through the micro-stamp to the patterned liquid layer or alternatively, or in addition to, the patterned liquid layer can be cured or dried with a suitable radiation transmitted through the substrate (See column 6, lines 29-42).

As to claim 3, it is well known in the art that IR radiation is a *conventional* thermal radiation source.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have thermal radiation (i.e. claimed IR) as a heating source in Jacobson et al with the expectation of providing the desired cured patterned layer since Bulthaup et al teach that the patterned liquid layer can be cured or dried while the substrate and the micro-stamp are in contact using a suitable curing radiation generated from a radiation source such as thermal radiation.

As to claims 6, 20 and 31, It would have been obvious to one of ordinary skill in the art at the time the invention was made to have cured a liquid layer in Jacobson et al with a thermal radiation transmitted through the stamp instead of a thermal radiation transmitted through the substrate since Bulthaup et al teach that the patterned liquid layer can be cured or dried while the substrate and the micro-stamp are in contact using a suitable curing thermal radiation that is transmitted either through the micro-stamp to the patterned liquid layer or alternatively, or in addition to, the patterned liquid layer can be cured or dried with a suitable radiation transmitted through the substrate.

Clearly, when the liquid layer is cured with a thermal radiation transmitted through the stamp, the radiation heats the subsequent polymer at a greater rate than the substrate.

As to claim 31, It is the Examiner's position that the processed polymer layer in Jacobson et al in view of Bulthaup et al would have claimed properties, e.g. 10 % or less of a deviation from planarity, since it is prepared and processed by methods substantially identical to that of claimed invention.

As to claim 33, one of ordinary skill in the art would understand that a film thickness depends on particular use of a final product.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant thickness parameters

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(including those of claimed invention) in Jacobson et al in view of Bulthaupt et al through routine experimentation in the absence of showing of criticality.

11. Claims 5, 7, 8, 15 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Jacobson et al.

Jacobson et al further teach that if the film 325 is partially cured, the film 325 can be fully cured after the stamp is removed (See column 6, lines 32-33). If it could be argued that Jacobson et al fail to teach that the subsequent polymer layer is fully cured after removing the stamp, it would be obvious to have made the subsequent polymer layer as the first polymer layer.

As to claims 5, 7, 8, Figs. 6A-6E show formation of a first patterned polymer layer 610 on a substrate 600 with a hole 612 (claimed recess) which exposes substrate surface (See column 9, lines 20-21, 23-34), and a second layer 620 exposing a first layer 610 is formed on the first polymer layer 610 (See column 9, lines 36-37). A first metal layer 630 is formed within the recess 612 (See column 9, lines 40-45), and a recess in the layer 620 (See Fig. 6D).

As to claims 7, 8, obviously a subsequent polymer layer applied onto the patterned film 325 may be formed to expose the surface of the film 325.

12. Claims 6, 8, 9, 13, 16, 20, 31, 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacobson et al in view of Carter.

Jacobson et al fail to teach that subsequently thermal curing is carried out under conditions to heat the subsequent polymer at a greater rate than the substrate (Claims 6, 20, 31 and 36).

Carter teaches that the patterned layer can be cured while the substrate and the micro-stamp are in contact using heat applied either to a stamp or substrate (See column 5, lines 19-22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have cured a liquid layer in Jacobson et al with heat applied to the stamp instead of substrate since Carter teaches that the patterned layer can be cured while the substrate and the micro-stamp are in contact using heat applied either to a stamp or substrate.

As to claim 9, Carter teaches that in a multilayer integrated circuit device, an underlying *layer* of insulated, planarized circuit lines can function as a *substrate* (See column 6, lines 27-29). Therefore, one of layers in a multilayer electronic structure of Jacobson et al may be considered a substrate having layers on its upper and lower sides, as required by the claim.



As to claim 16, Jacobson et al fail to teach that a metal layer can be deposited by any deposition method including electroless deposition. Carter teaches that a metal layer can be deposited by any deposition method including electroless deposition (See column 6, lines 8-13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used electroless deposition for depositing a metal layer in Jacobson et al Carter teaches that a metal layer can be deposited by any deposition method including electroless deposition.

As to claims 13, 34, Jacobson et al fail to teach in situ testing the substrate while attached as part of an array of substrates. However, it is well known in the art that electroless plating of the copper metallization allows *in situ* testing for a substrate right in a board.

13. Claims 11-13, 18, 19, 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carter.

As to claims 11-12, 18-19, Carter fails to teach that the cured polymer first film includes a film-to-substrate thickness ratio selected from about one-tenth, one-eighth, one-fifth, one-fourth, one-third, and one-half the thickness of the substrate.

One of ordinary skill in the art would understand that a film thickness depends on particular use of a final product.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant thickness parameters (including those of claimed invention) in Carter through routine experimentation in the absence of showing of criticality.

As to claim 13, Carter fails to teach in situ testing the substrate while attached as part of an array of substrates. However, it is well known in the art that electroless plating of the copper metallization allows *in situ* testing for a substrate right in a board.

14. Claims 11-12, 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacobson et al.

Jacobson et al fail to teach that the cured polymer first film includes a film-to-substrate thickness ratio selected from about one-tenth, one-eighth, one-fifth, one-fourth, one-third, and one-half the thickness of the substrate.

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One of ordinary skill in the art would understand that a film thickness depends on particular use of a final product.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant thickness parameters (including those of claimed invention) in Jacobson et al through routine experimentation in the absence of showing of criticality.

15. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carter in view of Cobbley et al (US 6,545,498).

Carter fails to teach in situ testing the substrate while attached as part of an array of substrates.

Cobbley et al teach that flip-chip semiconductor assemblies, each including integrated circuit (IC) dice and an associated substrate, are electrically tested before encapsulation using an in-line or *in-situ* test socket or probes at a die-attach station (See Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have tested a substrate of Carter in situ because Cobbley et al teach that flip-chip semiconductor assemblies, each including integrated circuit (IC) dice and an associated substrate, are electrically tested before encapsulation using an in-line or *in-situ* test socket or probes at a die-attach station.

### ***Conclusion***

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elena Tsoy whose telephone number is 571-272-1429. The examiner can normally be reached on Monday-Thursday, 9:00AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elena Tsoy  
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July 19, 2006